Claims

1. A method of calculating a sampling function for fabricating a N-channel grating, the method comprising the steps of:

- forming a summation of N periodic seeding functions each describing a refractive index variation, wherein each periodic function includes a phase shift value with respect to the other functions, and wherein at least one phase shift value is non-zero.

2. A method as claimed in claim 1, wherein the summation of the N periodic functions comprises a Fourier analysis.

3. A method as claimed in claim 2, wherein the result of the Fourier analysis is expressed as:

$$\sum_{l=1}^{N} \kappa e^{i[(K_0 z+\theta+(2l-N-1)\Delta\kappa z/2+\phi_l]} = \kappa Q e^{i(K_0 z+\theta+\psi)}$$

4. A method as claimed in any one of claims 1 to 3, wherein the method further comprises the step of determining a set of the phase shift values for which a maximum value of the sampling function amplitude is minimised.

5. A method as claimed in any one of claims 1 to 3, wherein the method further comprises the step of determining a set of the phase shift values for which a maximum difference between a maximum and minimum value of the sampling function amplitude is minimised.

6. A method as claimed in any one of claims 1 to 3, wherein the method further comprises the step of determining a set of the phase shift values for which a mean-square-deviation in the sampling function is minimised.

7. A method as claimed in any one of claims 4 to 6, wherein the step of determining the set of phase shift values comprises direct scanning through all combinations, or conducting a variational analysis, or using other forms of extremum search numerical techniques, or a simulated annealing Monte Carlo approach.

8. A method as claimed in any one of the preceding claims, wherein the grating is multi-dimensional, and wherein the periodic seeding functions are multi-dimensional.

9. A method for fabricating a multi-channel grating comprising the step of calculating a sampling function in accordance with a method as claimed in any one of claims 1 to 8.

10. A method as claimed in claim 9, wherein the multi-channel grating is fabricated utilising photo-induced refractive index changes in a photosensitive waveguide material.

11. A method as claimed in claim 9, wherein the multi-channel grating is fabricated utilising etching techniques.

12. A method as claimed in claim 9, wherein the multi-channel grating is fabricated utilising epitaxial techniques.

13. A method as claimed in claim 9, wherein the multi-channel grating is fabricated utilising a developing technique.

14. A method as claimed in claim 13, wherein the developing technique comprises a photo polymerisation process.

15. A multi-channel grating structure fabricated utilising a method of fabrication as claimed in any one of claims 9 to 14.